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SCIENCE

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THE WAR AND THE CHEMICAL INDUSTRY¹

PHILADELPHIA was the cradle of chemistry in this country. What was possibly the first chemical society in the world was founded here in 1792. A few years later one of its members addressing the society said:

The only true basis on which the independence of our country can rest is agriculture and manufactures. To the promotion of these nothing tends in a higher degree than chemistry. It is this science which teaches man how to correct the bad qualities of the land he cultivates by a proper application of the various species of manure, and it is by means of a knowledge of this science that he is enabled to pursue the metals through the various forms they put on in the earth, separate them from substances which render them useless, and at length manufacture them into various forms for use and ornament as we see them. If such are the effects of chemistry, how much should the wish for its promotion be excited in the heart of every American! It is to a general diffusion of knowledge of this science, next to the virtue of our countrymen, that we are to look for the firm establishment of our independence. And may your endeavors, gentlemen, in this cause, entitle you to the gratitude of your fellow citizens.

Considering the time when these words were spoken, we must marvel at the vision of the future which must have illuminated the mind of the speaker. If in the last clause quoted he had said "ladies and gentlemen" it would have been complete.

But Philadelphia was also the cradle of the chemical industry in this country, and up to the present day occupies a very important part of that field. Some of the pleasantest recollections of my earlier life

¹ Address complimentary to the citizens of Philadelphia given by Dr. Wm. H. Nichols at the Philadelphia Meeting of the American Association for the Advancement of Science.

are associated with those fine men then prominent here, but now mostly passed on, who made this city respected wherever chemical products were concerned, and not an insignificant part of my youthful enthusiasm was imbibed from them.

Therefore, when I was asked to talk to you on the subject of the war and the chemical industry, I accepted with the hope that I might add something to the general knowledge on the subject, and in a modest way pay a portion of an old debt. In the interval which has elapsed, however, the ground has been covered by many men on many occasions, and I find myself in the position of talking to you on a subject as well understood by most of you as it is by myself. There may be certain phases, however, which will repay further thought, and possibly there may be deductions worth considering. I shall therefore ask your indulgence if I ramble somewhat, and talk largely about what we have not done, avoiding dry statistics as far as possible.

Some of us may be old enough to remember our own civil war. Most of us remember the so-called Spanish war. Any knowledge or experience gained from these wars, intimate as the former was, gives no data on which to base any calculation as to the world-wide results of the present devastating struggle. Even our imaginations are unable to satisfy our judgments, which are more or less consciously or unconsciously influenced by our point of view. It is simply impossible to forecast the results industrial, geographical or moral. The world has never seen anything like it before, and, therefore, reasoning from analogy is entirely out of the question. We know this, however, that where such an enormous number of men are withdrawn from ordinary pursuits, many never to return, and such incalculable damage is done to property, the world must feel for

many years to come the effects which this impoverishment must produce. We might just as well accustom ourselves to the thought that before us lie years of painful toil and reconstruction, so that prudence, that great virtue of our forebears, may become more and more a part of us, and drive out the vice of extravagance which has become such a prominent characteristic of our people.

Judging from what we read in the papers, we might conclude that the chemical industry in the United States is in an infantile condition, and hardly worthy of serious consideration. Those not acquainted with the subject are ready to admit without argument that almost any European country is far and away ahead of us in volume and ability to produce economically. A glance at the 13th United States census will dispel at least some of these views, and is well worth taking. It includes under the heading "chemicals and allied products," nine principal divisions, and gives the value of the output of each.

1. Paint and varnish	\$125,000,000
2. Chemicals (general)	117,000,000
3. Fertilizers	104,000,000
4. Explosives	40,000,000
5. Dyestuffs and extracts	16,000,000
6. Sulphuric, nitric and mixed acids.	10,000,000
7. Wood (except rosin and turpentine).	10,000,000
8. Essential oils	2,000,000
9. Bone, carbon and lamp black	2,000,000

The above values were produced by 2,140 establishments, having a capital of \$483,000,000, and employing 88,000 persons. The census does not state, however, what is probably the fact, that the United States produces more sulphuric acid by catalysis than any other country in the world, and possibly more than all other countries combined. This fact has a bearing on what will be alluded to later, namely, the possible manufacture of coal-tar dyes and other products, for which fuming sulphuric acid is often an absolute necessity.

The census furthermore shows that the return on capital invested in the chemical and allied industries is not so great as in other branches of manufacturing endeavor. This is due to the high initial cost of plant, frequent alterations and reconstructions made necessary by the advance of knowledge, and I imagine by a somewhat senseless competition which has seemed to affect chemical manufacturers for as long as I can remember.

Owing to the enormous territory covered, the conditions governing the industry are quite different from those existing in other countries. Like all industries the greatest economies can be practised in the largest units, but this fact of extensive territory which is served makes numerous small units necessary. The products usually are bulky and low priced, and railroad freights play an important part in the problem. This fact must be borne in mind constantly when comparing the industry in this country with that in any other.

We Americans are apt to pride ourselves on the progress which we have made along manufacturing lines, and take to ourselves great credit for what has been accomplished. In view of the enormous supply of various raw materials which this country has at its disposal, an analysis of what we have done, I fear, would show that instead of taking undue credit to ourselves we should be very humble because we have not done much better. Of course I realize that this is a comparatively new country, and that it took time to get things into working order. Lines of communication had to be constructed, factories had to be built and rebuilt, and all the necessary impedimenta of industry had to be evolved from a condition which, at the time the Philadelphia chemist quoted in the beginning spoke, consisted of little more than

forests, prairies and prospects of mines. If during this period of development a good deal of waste occurred, and a number of abuses crept in, it is not so much to be wondered at. We have, however, arrived at a period when it is borne in upon us from all sides that conservation of natural resources, as well as human energy, is absolutely essential if we are to go forward with anything like the strength and certainty to which our resources entitle us.

Of raw materials for the chemical industry, without going into unnecessary voluminous details, we have an abundance—cheap phosphate rock, salt, copper, sulphur, coal, wood, bauxite, zinc. In addition to raw materials, and among our most valuable assets are our college professors of chemistry, who, I am sure, could, if called upon, render additional priceless service to the lasting benefit of the world and of themselves.

On the other hand, we must import much of our sulphur in the form of pyrites, nearly all of our potash, all of our tin, nickel and nitrate of soda. We have large supplies of nitrogen, available from animals and coal. But the great supply of the future is still in the air. This source of supply, however, has up to the present time proved rather difficult of access. Of course it must be secured, but just how is not altogether clear in spite of the good work already accomplished. This is one of the problems which the chemist, chemical engineer and electrical engineer must solve, however, within a comparatively few years, as the nitrate beds of Chili, while still very large, will some time come to an end.

With the Allies in command of the sea the war has not affected any of these raw materials very greatly, except potash. This salt is widely enough disseminated in various forms in this country, but where of hopeful strength it is inaccessible, and

where accessible it can not be produced without expensive plant construction which would probably be useless as soon as the German supply is once more obtainable. In arriving at this conclusion due note must be made of the German costs and not of the German selling prices. The Stassfurt salts can be produced very cheaply indeed, and the price which they have been able to bring in the markets of the world have yielded an enormous profit. This fact, of course, is a determining one when we talk of producing our own potash.

One of the most important of the chemical industries is the manufacture of fertilizers for the soil. We have in this country enormous deposits of phosphate rock, easily accessible and cheaply mined. This rock has been exported in large quantities to Europe and the Orient and is in sufficient quantity to last a number of years even in the careless way in which it has been used. A complete fertilizer, however, requires potash and, as noted above, we have been in the habit for a number of years of getting our potash from Germany, and there is every reason to expect that we will continue to do so for many years to come. If, as one of the results of the war, while it lasts, enough potash can not be obtained to make the fertilizers to which we have been accustomed, I feel that this will not be an absolutely hopeless misfortune. It is quite possible that the propaganda for the use of potash has been carried too far, and that less could be used on the soil without any great disadvantage. At any rate, we will be quite able to furnish an abundance of fertilizers in this country containing phosphoric acid and nitrogen, and if for a while we have to rely more or less upon the soil to furnish its own potash, I imagine we will not suffer beyond redemption. From some quarters in the south and elsewhere I have heard rumors

that a smaller cotton crop would be looked upon as a blessing, and it is quite likely that without government or other assistance the natural laws of supply and demand will produce a smaller crop next year, simply because there may not be enough potash to supply the requirements of a large one.

With here and there an exception, the only effect the war has had upon the chemical industry is the effect which it has had upon those industries which consume its output, and I think this can be taken as a general statement covering all articles. Of course, there are notable exceptions, such as smokeless powder and other products required for war purposes.

Some heavy chemicals, the receipt of raw material for which has been very much curtailed or stopped altogether, have advanced sharply in value, but generally speaking the chemical industry has not profited by advanced prices as a result of the war. Owing to reduced home consumption, the result in some cases has been a great falling off in profit, a condition which I trust will not be of long duration. I am a believer that the manufacturing industries of this country will before very long be on the up grade and all of the chemicals produced, speaking generally, will be needed.

More has been talked and printed lately about a portion of the chemical industry which has not taken very deep root in this country, than about all the rest of the industry put together. I refer to the organic chemicals resulting from products of the distillation of coal tar. Many have wondered why the American chemist has not stepped up and taken the place of the foreign manufacturer in supplying the textile and other industries with colors, evidently not understanding the size and complexity of the question. I think it worth while, there-

fore, to discuss this at some length, as it is probably the most pressing question before the chemical world in this country to-day and I fear the one least likely to receive a favorable reply. A few years ago every coke oven in this country was what is known as a beehive oven, and all the by-products of the distillation of coal were lost. It is only in comparatively recent years that by-product furnaces have been constructed and various by-products saved. The ammonia was naturally first utilized and the products of the distillation of tar have been among the last. In fact, a theory existed in the minds of many people that the tar produced by American coal did not possess the necessary constituents to make it useful as a basis for the production of organic chemicals. I have been myself told by one of the large producers in Germany that it was absolutely certain that American coal did not possess the necessary qualities. The object of this information was probably to put out of my mind any latent ambition along forbidden lines, but as it was given by the commercial manager and not by one of the scientific staff, I believed him, but wondered if it were true.

In a lecture delivered to the board of directors of the General Chemical Company on October 23, 1914, the subject and its difficulties were outlined by Dr. B. C. Hesse. Owing to the immensity of the subject only a small part of it was treated. This able lecture has since been published in the *Journal of Industrial Chemistry*, but I can not do better than quote from it freely, as I consider it the best exposition of the case that has come to my attention. He says:

At the very beginning it should be pointed out that the world's market in coal-tar dyes, as it stands to-day, comprises, in round numbers, 900 distinct and different chemical substances which

are made by the aid of 300 products of transformation, themselves not dyes, of 10 products obtained or obtainable from coal-tar by distillation, refrigeration, expression or the like. Therefore, actually and in reality the present coal-tar dye industry comprises no fewer than 1,200 different products and as many or more different processes of manufacture and requires many hundred different sets of apparatus of varying capacity and of different kind for many hundred different operations. A manufacturing problem comprising so many independent and yet interlaced units of manufacture and production has therefore within it many elements of complexity.

World's figures are not available. The fullest, best, most dependable and most recent figures are those dealing with Germany. In the year 1913 the total export value of Germany's coal-tar industry, including dyes and products of chemical transformation or intermediates, amounted to \$55,264,522 distributed over 33 countries and shared in by 22 factories; on June 30, 1912, 21 of these factories had a combined capitalization of \$36,700,000 and declared and paid dividends of \$11,600,000, or 21.74 per cent. of the capitalization, for that year.

Of the 5,369 active corporations in Germany on June 30, 1912, 1,004 or 18.69 per cent. are divided into 19 groups of the chemical and allied industries. Arranged in the order of their income-producing effects these 19 groups are, in part, as follows:

	Per Cent.	No. of Corporations
Coal-tar dyes	21.74	21
Metallurgy	11.78	61
Soaps and candles	11.65	21
Glass	11.61	38
Heavy chemicals	11.51	104
Explosives	11.22	28

The remainder range between 5 per cent. and 10 per cent., except mining which is at the foot of the list with 0.51 per cent. return.

Therefore, any attempt to take away coal-tar dye business from Germany means attacking the best equipped and the best income producer of Germany's entire chemical and allied industry.

Dr. Hesse estimates as follows on the entire world production:

Germany	\$68,222,846
Great Britain	5,982,675
Switzerland	6,452,651
France	5,000,000
United States	3,750,000
	\$89,408,172

with Russia, Holland, Austria and Belgium to be added. Allowing \$10,000,000 for these, which is clearly very high, it makes the absolute maximum production all over the world substantially \$100,000,000.

The development of the coal-tar dye industry called for 8,062 German patents in the years 1876-1912 or 224 per year; corresponding patents have been taken out in other countries, *e. g.*, 2,432 in the United States.

But it is authoritatively said that only 1 in 100 of the German patents is a money-maker, and as a matter of fact, in the case of the 921 dyes in the world markets at the end of 1912, only 485 U. S. patents and 762 German patents were involved or 19.94 per cent. of the total U. S. and 9.46 per cent. of the total German patents. Of these 921 dyes 50 per cent. were never patented in the United States, the U. S. patents on 26 per cent. have now expired, leaving 24 per cent. still covered by existing U. S. patents and many of those expiring in 1915.

Broadly speaking, the entire coal-tar dye industry is a complicated maze and network of interlocking and interlacing products and by-products; these are great in number but, in most cases, small in volume individually. In numerous instances the very existence of the by-products was the sole directing cause for the invention of new dyes and classes of dyes.

The average annual unit gross per year of the 900 coal-tar dyes, exclusive of alizarin and indigo, all over the world outside of Germany has previously been shown to be about \$41,000. Add to this fact the interlocked and interlaced dependence of intermediates and finished dyes, further that the German works have long ago fully paid for their plant, their experience and their sales organization and the result is what seems to be a complete answer why Germany controls the world's coal-tar dye market. In fact, the whole industry, taking everything into account, is just about a one-nation business. It is a business made up of a large number of small units and all units essential to success.

Germany has this business established in 33 other countries; it is evident that any country starting in now would be greatly handicapped thereby if it attempted to enter the race for the full distance.

Although Germany has relied upon Great Britain for its crudes, *i. e.*, its benzol, its toluol, its naph-

thalene and its anthracene up to the middle of the '90's, and perhaps later, yet England has not been able to make any headway, but on the contrary has always lost ground. Many of these non-patented world's dyes are also non-patented in England, yet most of Great Britain's requirements of those materials have always been supplied by Germany.

The answer to the question as to why Great Britain has not succeeded against Germany can not be that Great Britain is not a nation with highly developed chemical industries. A German chemist as well equipped as any other living man to express an opinion and to compare German industries with British industries has said the following:

"To be sure, we know that several of the European countries, *e. g.*, England, are still ahead of us in many branches of the chemical industry, especially in inorganic manufacture. But in no country on earth are those branches of the chemical industry which demand versatility of thought, and particularly a large body of scientifically trained employees, so well developed as with us. Our synthetic dye, synthetic drug, and perfumery industries are foremost throughout the world, and there is probably no country in which the heads of factories are so imbued with the conviction that their employees must needs cast a glance beyond domestic boundaries."

Each one of the large chemical manufacturing countries of Europe, without exception, buys more intermediate products from Germany than it sells to Germany and all of the countries but one, namely, Switzerland, buy more dyestuffs from Germany than they sell to Germany. In other words, and broadly speaking, all the rest of the world, outside of Germany, merely assembles intermediates purchased from Germany, into finished dyes; Germany alone makes all its own intermediates; that is, Germany makes all the dye-parts and the rest of the world assembles these dye-parts into finished dyes. Needless to say, the one who controls the manufacture of dye-parts actually controls the manufacture of dyes.

Where Austria, Belgium, France, Great Britain, Italy, Russia and Switzerland singly and combined have failed, in spite of their large other chemical industries, to take away this business from Germany, the American chemist should not be blamed nor found fault with because he has not succeeded, nor should it be assumed that transplanting of the whole industry can be done at once and is a perfectly easy thing to do, as so many seem to think. The transplanting of that industry

out of Germany is an undertaking properly and fitly to be described as titanic.

Why the other countries have failed is probably due to the fact that they contributed little or nothing to the real upbuilding of the business and to its creation, for the coal-tar dye business is a *created* business; those who aided in its creation were in a position first to reap the benefits—an advantage they have no doubt earned and deserved through the effort they expended and the risks they assumed.

In 1913 Germany had for sale to foreigners \$3 worth of these products as against every dollar's worth that it needed at home.

Nine hundred different dyes were on the United States markets of which one hundred were made or assembled in this country from intermediates purchased from Germany. Yet these one hundred do not seem to be enough for American dye-users. How much less than the full nine hundred will satisfy American users is known to them and to the importers; the latter can not be expected to divulge that information; if the former want substantial help from American chemical makers *they* must divulge it, no other way of ascertaining being available.

In 1909 the United States produced \$3,462,436 worth of artificial dyes which are probably anilin dyes in the strict sense. Compared with Switzerland's \$3,200,000 production, *i. e.*, "assembly" in 1896 this is an achievement of which Americans need not be ashamed. The wonder is not that we have not done more but that in the face of the well-organized manufacturing plants of Germany and of Germany's very much superior facilities for foreign trade, both banking and carrying, that we have done as much as we have. Blame should not be parcelled out for what American chemists have not done, but credit, which has been so far withheld, should be given for what has been done in spite of obstacles abroad and obstacles at home. The users of dyestuffs have invariably opposed any tariff enactment that would substantially encourage a domestic production of coal-tar dyes. That so many are produced in this country as are being produced is due to no cooperation of dyestuffs users but was accomplished in spite of their obstruction and if to-day the users are in serious difficulty through a lack of dye-stuffs they have their own shortsightedness to blame and can not, by any argumentation whatever, shift the blame to American chemists. With proper help and encouragement the American chemist will be able to increase the domestic production of coal-tar dyes

and to inaugurate the making of intermediates; in the course of time this country may then ultimately look forward to a substantial share of the world's coal-tar dye business.

Hardly any of the valuable or useful intermediates ever were patented. A considerable number of non-German chemists have invented and patented finished dyes made from non-patented intermediates. These inventors had perfect freedom to make the needful intermediates and an *exclusive* right to make, sell and use their new dyes therefrom, yet they bought their intermediates from Germany rather than make them themselves. The patent situation is therefore, really, that Germany excelled the rest of the world in making patentable combinations from non-patented and non-patentable intermediates and further in making those non-patented and non-patentable intermediates in open competition with the rest of the world. So, from one point of view, it appears that the rest of the world, inclusive of the United States, lay back, let the Germans do all the hard work and when the rest of the world finally woke up to the value of what the Germans had accomplished they became very busy making excuses and explaining instead of making a determined, directed, united and effective attempt to recover the ground so lost. That such a recovery will require the hardest kind of work on the part of all, users, capitalists, consumers and makers alike, is self-evident and obvious and the question is: do we want to pay the price? It can be done, if the price be paid.

At the conclusion of Dr. Hesse's lecture the directors were called upon for remarks. One well qualified arose and simply quoted from Mrs. Stowe's "Old Town Folks":

One of the characters, Sam Lawson, had gone to "meetin' house" to hear the new preacher, and returning shortly afterwards to the kitchen, where the "women folks" were preparing the meal, they inquired of him why he happened to come so soon—"surely meetin' couldn't be out."

He replied: "No, meetin' isn't out, but the preacher said how by a state of natur' we were all down in a deep well, and the sides of the well were *glar* ice. There warn't one in ten, warn't one in one hundred, warn't one in a thousan' never get out, and yet it war the partickler duty of every one of us to get out. At that pint in the discourse, I rose and went out, thinkin' any one was welcome to my chance."

From the foregoing it will appear as if the opportunity to produce colors and other articles and products in a large way in this country, while open, are not likely to be availed of to any great extent during the existence of the present war, unless the war should last much longer than even the most pessimistic fear.

I might say, however, in this connection that I remember distinctly being told by one of the best authorities on the subject that it was absolutely impossible to manufacture Portland cement in this country and it might just as well be put aside as one of the things for which this country was not adapted. I have also heard exactly the same statement regarding soda ash and caustic soda, and yet these articles somehow or other have become rather important articles of our manufacture and for a long time we have not been obliged to call loudly for outside help.

In spite of the difficulties, however, some feeble steps have been taken here, partly, I confess, out of curiosity to learn if it were really true that our coal lacked the self respect to hold all the treasures it should possess; when, strange to relate, out came aniline oil of the best quality. What happened then is worthy of note, as it shows at least one state of affairs which it is necessary to correct if we are going to escape from the dilemma which discouraged Sam Lawson. As soon as American aniline oil was offered for sale, down went the price below cost. A tariff of 10 per cent. put upon it by Congress as a compromise between judgment and party, was immediately absorbed by the foreign makers, and the price here became lower still. You see, on the other side of the Atlantic they believe in cooperation. Here our legislators think we believe in destructive competition, and have made cooperation one of the seven deadly sins. Nothing but

demonstration by the ballot box will prove the contrary. A man with his ear to the ground does not always hear the "music of the spheres." The low price of aniline oil had no relation to its cost. It was simply dumped, by agreement, to discourage the American infant. And it did.

Many devices have been suggested to encourage the coal-tar dye industry in this country, such as a high protective tariff and changes in the patent law.

The former does not seem likely to be evolved, although a good deal can be said on the side that a high tariff in these articles would either result in the establishment of the industry or else produce a considerable revenue, either end most desirable to attain. The latter is such a complex subject that it is not so clear that good results would ensue on changing the patent laws. While it is important to establish a coal-tar dye industry as far as is practicable, we must not be selfish enough to forget that there are other important industries already established, and the American people must learn more and more to consider the rights and needs of the individual in their relation to the rights and needs of all.

Another obstacle, besides the patent laws and the absence of tariff protection, to the establishment in this country of any new industry strongly intrenched abroad, is to be found in the inadequacy of the anti-trust laws to protect American industry against systematic dumping of goods from abroad at prices substantially less than foreign prices with intent to injure or destroy the local industry.

Much has been done by the present Congress in the creation of a trade commission and in the statutory condemnation of certain specific practises to render those laws more efficient; but, taken as a whole, the efficiency of those laws, so complete for

domestic commerce, is quite unsatisfactory when applied to imports from abroad, and that despite the very real help to be expected from the new trade commission.

The trouble lies partly in the inherent difficulty of the subject and partly in the inadequacy or ambiguity of previous legislation. First of all, our anti-trust laws can have no extra-territorial force. Cartels and trusts that would be invalid here are lawful abroad, and in so far as these operate on their own soil, even to our detriment, the individuals concerned can with difficulty be reached so long as the acts done are lawful in the country where they are done. But these unfair practises must express themselves in imports into this country, and this implies the existence of importers or agents who must either be, or occasionally come, within the jurisdiction of our laws.

And so we find in 1894 our Congress partially legislated on this very subject, and by the anti-trust sections of the Wilson tariff law (secs. 73-77) visited upon importers who should combine in importing to restrain trade in this country all the pains and penalties of the Sherman law of 1890, namely, fines, imprisonment, forfeiture of goods in transit, triple damages, injunction and dissolution.

But this Wilson bill, which may well be deemed to be the exclusive expression of congressional purpose on this subject of imports, is confined to restraint of trade by two or more—and it does not, like the Sherman law, prohibit monopolizing, nor acts done by one person or corporation alone, nor does it prohibit unfair methods as such.

Now the unfair methods here complained of are precisely those which tend to monopoly by the destruction of competitors, and they can as well be employed by a single powerful concern as by a combination.

Viewed merely as "unfair methods," it is probable that they would not have been held by the courts to have fallen under the Sherman law so long ago as 1894; but would have been classed among those acts which the Supreme Court has lately characterized as "no more than ordinary acts of competition or the small dishonesties of trade."

But in the last few years ideas on this subject have undergone a complete change, and many methods formerly thought legitimate have passed under the ban of the law. Railway rebates are a notable example of this; and now with the legislation of this year we find legislative authority for the condemnation of unfair methods of competition generally, and notably discrimination in prices with intent to injure.

Admirable as are these provisions, there is nothing in the new statutes which extends their scope by way of amendment to the Wilson bill and to imports—and there is much to indicate the legislative intent to confine those provisions to domestic commerce alone. The word "commerce" both in the unfair methods clause (sec. 5, commission bill) and in the price discrimination clause (sec. 2, Clayton bill) is defined as commerce among the states or between this country and a foreign country, and this definition excludes the idea of its including also commerce within a foreign country.

The practises that we complain of involve commerce not in the restricted sense as defined, but a commerce that includes foreign countries as well as our own. But if these practises of foreigners and importers are nevertheless to be deemed unfair methods within the commission bill (sec. 5), the only remedy for them is an order of the trade commission to desist. They are not expressly prohibited by the act itself, nor made punishable in any way. If, however,

these practises are to be deemed price discriminations within the Clayton bill (sec. 2), which seems impossible, then the only remedy besides an order to desist is a right to sue for triple damages. The difficulty in estimating any damages at all is obvious enough in any case; especially so in the case of the destruction of a small *new* industry, and still more so in the case of an embryo industry that has never raised its head.

Even if Sec. 2 of the Clayton bill apply, we must assume that it creates a new offence not included in either the Sherman or the Wilson bills; hence that there would be no authority of law for any remedy except those alluded to as given in the act creating the offence, especially so inasmuch as the Wilson law stands out unrepealed as the sole legislative expression on the subject of imports and is silent and unamended upon the subject of price discrimination.

If this conclusion be correct (and it is almost as bad if the law be in doubt) there exists a situation where the equal protection of the laws is not extended to the importer and the domestic manufacturer alike. On the contrary, a practical license is given to the importer to do that which the citizen is forbidden to do.

The foreign manufacturer or importer seldom has any inducement to act in restraint of trade as we commonly understand it, or to monopolize competing plants in this country; quite the reverse. His object is to build his monopoly by destroying a domestic industry, and one of his most potent weapons in doing this if he be well enough intrenched is to drop prices in this country below the prices which yield him profits abroad for a long enough period to drive out American competitors; when, having the market to himself, he may raise them again.

The penalties to be invoked against the foreign manufacturer and importer as deterrents are utterly inadequate to deter them from trying it on as before. The most that they can suffer from their practises is, as we have seen, a commission's order to desist, and perhaps in some cases a suit, difficult to prove, for triple damages.

What is needed is that these people should have before their eyes the same deterrents of fine, imprisonment, forfeiture of goods, triple damages, possible injunction and dissolution, as have rendered American business men careful neither to restrain trade nor monopolize nor indulge in unfair practises. The practises here condemned in reality amount to much more than mere unfair methods of competition; they verge on an illegal attempt at monopolizing. It is of the essence of monopolizing to exclude. The legislation of 1914 does not subject unfair methods in general to the criminal features of the anti-trust laws, and this is doubtless wise. But this particular offence is in its nature monopolistic and criminal, and it is the most effective form by which the foreigner can evade our anti-trust laws and illegally injure or destroy American industry. What is needed is an amendment of the anti-trust sections of the Wilson tariff act carrying into it the prohibitions against monopolizing of the Sherman act, even when practised by one person alone, and expressly defining the practise here condemned as an act of monopolizing. The pains and penalties of the Sherman and Wilson acts would then follow on these practises as a matter of course.

At the present time, when there can be no longer any thought of procuring additional protection of new industries through the tariff, it will be rash to hope that American capital and enterprise should further

embark in any of those industries, new or unknown here, which are firmly intrenched abroad, and where, as soon as the war is over, the foreigner can return to the work of attack and destruction by the methods above mentioned.

This plan, which aims to place Americans and foreigners on the same footing here could, it seems to me, be easily and quickly enacted by the present Congress. It would put American manufacturers, including American chemists, in a position to act without having all the chances against them. Are they not entitled to at least this much?

I do not believe in hothouse development of industries for which we are not adapted; but save us from the cold-storage conditions resulting from perfect organization being arrayed against us so that our real opportunities which we are in every way qualified to enjoy are frozen to death. The little aniline-oil experiment alluded to above has come to life again, and in its small way has proved during these war times to be a godsend to our manufacturers. It is gratifying to note that it is even growing in a manner which it is hoped will be permanent. It seems too bad that it should require a dreadful war to make such a little start possible; it should have been accomplished as soon as our by-product coke ovens and fuming sulphuric acid production made it possible.

To sum up, the effects of the war on the chemical industry already established in this country are measured in general by their effects on the industries consuming chemical products. It has, however, been brought very close to us that certain industries not thoroughly established here but highly organized abroad are of tremendous importance to us. We have seen that this branch of chemical industry has been the

result of marvelous ingenuity, patience, research and cooperation during the more than half century since Perkin produced the first coal-tar dye in England. One of the lessons to us which it seems to me lies near the surface, and probably one of the most important lessons this people must thoroughly learn, is that of cooperation, which has had more to do with the making of the great coal-tar chemical industry than any other one influence. We as a nation have passed our childhood and youth; we have made gigantic progress at tremendous cost of materials and possibly of moral fiber; we have come to the parting of the ways. If we continue too long as we have been going we will deserve disaster if we do not actually experience it. We know on the highest authority that "a house divided against itself must fall." The laws of the resultant of forces familiar to us all show us what would happen if we all pulled in different directions. I feel strongly that our future success as a nation lies in universal cooperation—the government and its departments with the manufacturer, the manufacturer with the workman, and all together for the country and for the world; and this cooperation must not be based solely on self-interest, but more particularly on those moral qualities which lie at the foundation of universal brotherhood. It must not be the survival of the fittest, but the survival of all, and the very best that is in them brought out of all. When we have learned and adopted this lesson of cooperation for the good of all, we have started on the road to a national greatness, both material and moral, which I modestly feel that the possessions of this people qualify it richly to enjoy.

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